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This Technical Bulletin, which supplements the "Federal Guidelines: Design, Operation, and Maintenance of Wastewater Treatment Facilities", is a compilation of information to provide a high degree of reliability in the protection of shellfish waters. The purpose of this bulletin is to ensure that maximum protection is provided for shellfish waters receiving effluent discharged from municipal wastewater treatment works proposed for an EPA construction grant.

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TECHNICAL BULLETIN

PROTECTION OF SHELLFISH WATERS

JULY 1974

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Water Program Operations
Washington, D.C. 20460

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAM OPERATIONS

TECHNICAL BULLETIN

PROTECTION OF SHELLFISH WATERS

The Federal Water Pollution Control Act Amendments of 1972 establish an extensive program to upgrade the quality of our Nation's waters. The program of Federal grants for construction of municipal wastewater treatment plants will have significant benefits in reducing pollution and improving water quality. The effluents from many municipal plants could impact on shellfish waters, with serious potential for public health and local shell-fishing industries. As these plants are upgraded through the EPA construction grants program, it is essential that project designs include provisions for protection of shellfish waters.

This Technical Bulletin, which supplements the "Federal Guidelines: Design, Operation, and Maintenance of Wastewater Treatment Facilities", is a compilation of information to provide a high degree of reliability in the protection of shellfish waters. Much of the Bulletin is based on existing information from publications of the Environmental Protection Agency and the Food and Drug Administration.

EPA Regional Administrators will work closely with the Food and Drug Administration to reasonably determine if completed project designs provide a level of protection which meets the objectives of this bulletin. In some cases the need for construction of additional reliability features may be identified and appropriately accomplished in a project subsequent to the one being reviewed. By July 1975 it is anticipated that designs will be in accordance with the bulletin and routine project review by the Food and Drug Administration would not be necessary.

The Bulletin will be revised from time to time as additional information becomes available. All users are encouraged to submit suggested revisions and information to the Director, Municipal Construction Division (WH-447), Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 20460.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAM OPERATIONS

TECHNICAL BULLETIN

PROTECTION OF SHELLFISH WATERS

Purpose:

The purpose of this bulletin is to ensure that maximum protection is provided for shellfish waters receiving effluent discharged from municipal wastewater treatment works proposed for an EPA construction grant.

Applicability:

This bulletin applies to projects which could affect shellfish waters.

Relationship to National Shellfish Sanitation Program:

The National Shellfish Sanitation Program (NSSP) is a voluntary cooperative program conducted by the Food and Drug Administration (FDA) of the U.S. Department of Health, Education, and Welfare and 23 coastal States and the shellfish industry. NSSP requirements are contained in the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas (1965). This bulletin provides guidelines for design of publicly owned treatment works to meet the objectives of the Manual of Operations.

Definitions:

The following definitions apply to the terms used in this bulletin:

Shellfish: Molluscan shellfish species of oysters, clams, and mussels. As used in this bulletin, the term does not include other species, such as crabs, lobsters, shrimp, or scallops.

Shellfish Waters: Any waters which are classified by the State as either shellfish growing waters or potential shellfish growing waters.

Shellfish Growing Waters: Waters classified by the State as acceptable for commercial or recreational harvesting of shellfish. In the manual of operations these are classified as either Approved or Conditionally Approved growing areas.

Potential Shellfish Growing Waters: Waters classified by the State as not presently acceptable for commercial or recreational harvesting of shellfish, but which the State plans to make acceptable in the future by improving certain conditions. In the NSSP Manual of Operations these would be presently classified as either Restricted or Prohibited growing areas. To be in this category, the waters must have been formally classified by the State as potentially meeting the approved shellfish growing water quality requirements for the production of shellfish.

Background:

These guidelines are necessary because of the public health hazards resulting from the harvesting of edible moluscan shellfish from waters subject to discharge of pollutants. Shellfish are known to concentrate pollutants from the aquatic environment. The quality of the shellfish is directly related to the quality of the overlying waters. In the past there have been numerous typhoid fever and infectious hepatitis outbreaks associated with the consumption of sewage contaminated shellfish. Since shellfish are frequently eaten uncooked or partially cooked, their habitat must be protected to preclude contamination and the resultant health hazard.

Action to be taken by the grant applicant:

1. Determine if the proposed project could affect shellfish waters. Some projects clearly could never affect shellfish waters, and this bulletin does not apply to such projects. Assistance in making this determination is available from the State water pollution control agency and the EPA Regional Administrator.

2. Assess the impact of the proposed project on the shellfish waters. This is accomplished during the facility planning phase (see Section 35.917, 40 CFR 35). Coordination with environmental protection authorities, shellfish regulatory agencies (Appendices 1 and 2), and local interests must be initiated early in the project planning. The assessment of total impact, and screening of alternatives for cost-effectiveness analysis (40 CFR 35, Appendix A) will include, but is not limited to, the determination of the following:

a. Location of the effluent discharge in relation to the shellfish waters.

b. Volumes of wastewater.

c. Effluent quality expected under normal and adverse conditions. Includes bacterial quality, substances

that could be toxic (such as heavy metals or pesticides), or other materials which could adversely affect public health.

d. Estimates of the effect on the shellfish waters of combined sewer overflows or other uncontrolled discharges from the treatment works. Provide information on rainfall frequency, duration, and intensity, or other conditions, which cause overflows, bypasses, or significant reductions in treatment efficiency, and the locations in the project system where these conditions will occur.

e. A summary of NPDES municipal permit information on wastewaters introduced into the municipal system by industrial users.

f. The reliability of the processes and equipment included in the project, including an estimate of the frequency of adverse conditons affecting the shellfish waters and measures included in the project to increase reliability of wastewater treatment works performance or provide containment of potentially adverse discharges.

g. An evaluation of dilution, dispersion, mixing, thermal effects, and seasonal variations affecting the shellfish waters as a result of the proposed project.

h. Relate the present shellfish water conditions to those conditions expected during and after construction of the project. Information on the existing shellfish water conditions is available from environmental protection authorities, shellfish regulatory agencies, and public health departments.

3. Estimate the size of a closed safety zone around the outfall site. The closed safety zone is a designated portion of the shellfish waters adjacent to a source of contamination (such as an outfall) in which harvesting of shellfish would be prohibited. The closed safety zone is required by the NSSP Manual of Operations between conditionally approved growing areas and the source of pollution, and is subject to review and approval by environmental protection authorities and shellfish regulatory agencies. There is a two-fold objective in designating the closed safety zone. Both objectives are related to the time required for pollutants to travel from the source of pollution, through the closed safety zone, to the shellfish growing areas. One objective is to ensure public health is protected by

preventing pathogen contamination of shellfish waters from normally operating treatment works. Mixing, dilution, and natural pathogen die off occur as the pathogens tranverse the closed safety zone and the pathogen concentrations are decreased accordingly. The objective is achieved by defining the closed safety zone so that the pathogen concentrations beyond the zone are at acceptable levels under normal operating conditions. The second objective is to provide the time necessary for notification to cease harvesting in the shellfish growing waters following a malfunction in the wastewater treatment works. Define a closed safety zone to provide the required safety factor for both objectives. The factors to be considered in determining the boundaries for a closed safety zone are:

a. For normally operating wastewater treatment works:

   (1) The maximum concentration of contaminants (usually coliform bacteria) expected in the effluent before an emergency response plan is activated.

   (2) Time and distance from the discharge point for the effluent containing the maximum expected concentration of contaminants to be reduced to permissable levels, considering dilution expected under adverse conditions in the receiving waters (e.g., high stream flows and spring tides which result in minimum time of flow to the boundary and reduced salinity).

b. For a malfunction in wastewater treatment works:

   (1) The total time it would take for the wastewater treatment works operator to detect a malfunction, notify the shellfish regulatory agency, and for the agency to stop shellfish harvesting. Due consideration should be given to adverse conditions such as time of occurrence (weekend, holiday, or at night), the areas to be covered, and the methods of communication. In some cases instrumentation and alarms beyond the level established in this Technical Bulletin can be provided to reduce the time required to notify the shellfish regulatory agency of a malfunction.

(2) The reliability of wastewater treatment works. See paragraph 4b of this bulletin.

(3) The travel time for flow from the points of discharge to the Conditionally Appoved growing areas. Adverse conditions which will reduce travel time, such as river stage or tides, will be considered. Allowance must also be made for the expected degree of mixing.

(4) The safety factor to be provided. Normally the travel time through the closed safety zone should be twice the time required for the notification process to become effective. Where this is not feasible, provide increased reliability or storage.

c. Each of the above factors has some variability. Analyze these factors and determine the optimum combination to ensure protection of public health, preserve valuable shellfish growing waters, and provide for cost-effective wastewater treatment works.

4. Base the wastewater treatment works design on the following guidelines:

a. Federal Guidelines: Design, Operation, and Maintenance of Wastewater Treatment Plants.

b. Technical Bulletin "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability," EPA-430-99-74-001. Shellfish waters will be Reliability Class I. When conditions warrant (e.g., proximity of shellfish beds, unusual chlorine demand variations, excessive wet weather flows) a degree of reliability higher than described in EPA-430-99-74-001 may be needed. This could include increased disinfection contact time, larger holding basins, or equipment redundancy.

c. Discharges in close proximity to shellfish harvesting areas should be avoided. Where such dischargers are unavoidable, the applicant should contact environmental protection authorities and shellfish regulatory agencies for guidance.

d. Where the effluent discharge will be to waters designated by the State as potential shellfish growing waters, the

criteria will either be incorporated in the design or provision will be made to incorporate them by future modifications to the wastewater treatment works. The course of action to be followed will be based on the timing of planned actions to upgrade the shellfish waters.

e. Disinfection System. Effluent disinfection performance requirements are contained in the municipal NPDES permit. The permit is based on the EPA secondary treatment information (40 CFR 133), but more stringent requirements may be imposed for other conditions, such as water quality related to shellfish waters. Shellfish safety is closely related to reduction of pathogenic micro-organisms. Thus, the disinfection system must be designed to achieve high effectiveness and reliability. The following requirements apply where chlorine is used as the disinfectant. Other disinfectants are acceptable provided a level of performance and reliability comparable to chlorination is attained.

(1) The sanitation requirements for approved shellfish growing areas are given in the following quotation from the NSPP Manual of Operation:

"Growing areas may be designated as approved when: (a) the sanitary survey indicates that pathogenic micro-organisms, radionuclides, and/or harmful industrial wastes do not reach the area in dangerous concentration, and (b) this is verified by laboratory findings whenever the sanitary survey indicates the need. Shellfish may be taken from such areas for direct marketing.

"Satisfactory compliance. -- This item will be satisfied when the three following criteria are met:

(a) The area is not so contaminated with fecal material that consumption of the shellfish might be hazardous, and

(b) the area is not so contaminated with radionuclides or industrial wastes that consumption of the shellfish might be hazardous (see section c item 7 in the Manual of Operation, regarding toxins in shellfish growing areas), and

(c) the coliform median MPN of the water does not exceed 70 per 100 mil., and not more than 10 percent of the samples ordinarily exceed an

MPN of 230 per 100 ml. for a 5-tube decimal dilution test (or 330 per 100 ml., where the 3-tube decimal dilution test is used) in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions. (Note: This concentration might be exceeded if less than 8 million cubic feet of a coliform-free dilution water are available for each population equivalent (coliform) of sewage reaching the area). The foregoing limits need not be applied if it can be shown by detailed study that the coliforms are not of direct fecal origin and do not indicate a public health hazard. This MPN value is based on a typical ratio of coliforms to pathogens and would not be applicable to any situation in which an abnormally large number of pathogens might be present. Consideration must also be given to the possible presence of industrial or agricultural wastes in which there is an atypical coliform to pathogen ratio."

(2) Maintain an adequate chlorine residual in the chlorine contact chamber to ensure that the bacteriological requirements are not exceeded in the effluent or shellfish waters. Because of insufficient data available to relate effluent bacteriological quality and chlorine residual and variatons in types and strengths of wastewater, no specific chlorine residual is recommended.

(3) Provide sufficient chlorinator capacity to continuously maintain adequate disinfection with the largest unit out of service. Disinfection must be continuous during container and/or chlorinator changeover.

(4) Chlorine Contact Tank

(a) Premixing - Rapidly and thoroughly mix the chlorine with the wastewater before entering the chlorine contact chamber.

(b) Contact chamber - Design the chlorine contact chamber for a contact time of at least 30 minutes at the peak hourly flow rate. Additional contact chamber capacity or flow equalization may be necessary where there are unusually high peak flow rates.

Design the chlorine contact chambers in accordance with Paragraph 212.1.9 of Technical Bulletin "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability," EPA 430-99-74-001. Chambers should be designed to produce, as nearly as possible, a plug flow condition (plug flow occurs when each increment of flow is in the chamber for a time equal to the theoretical detention time). The design will include adequate measures to minimize short circuiting, stratification, and stagnation zones. Velocity variations within the chamber will be minimized.

(c) Outfalls - conduits conveying effluent will not normally be considered as part of the required chlorine contact chamber. One exception could be where the chlorine residual is continuously monitored at the end of the portion of conduit used for contact chamber.

(5) The chlorine residual in the effluent after detention in the chlorine contact chamber (or other conduit) will be continously monitored and recorded.

(6) Provide an alarm for low chlorine residual in the effluent. Additionally, depending on the size of the plant, proximity to the shellfish beds, and other safety factors, alarms may be required as indicated in Paragraph 243 of Technical Bulletin "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability," EPA 430-99-74-001. Examples of such alarms are:

(a) Disinfectant container depletion.

(b) Low chlorine water pressure.

(c) Automatic changeover.

(7) Design alarm circuits to indicate circuit malfunctions.

5. Include the following in the operation and maintenance manual for a facility which could affect shellfish waters:

a. Definition of the types of incidents or malfunctions to be reported to the shellfish regulatory agency and the maximum acceptable time for accomplishing this report.

b. An emergency response plan, including procedures to be used to make reports to the shellfish regulatory agency.

c. Recommended frequency of laboratory check tests to verify performance of analyzers such as chlorine residual indicator and recorder.

d. Recommended frequency and types of laboratory tests required for monitoring coliform bacteria.

References:

1. "National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas", 1965 Revision, U.S. Department of Health, Education and Welfare, Public Health Service.

2. EPA-430-99-74-001, Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, 1973., Office of Water Program Operations, EPA.

Technical Assistance:

Criteria and technical assistance for specific problems may be obtained from local or State environmental protection authorities or agencies concerned with the protection of shellfish wates. Additionally, assistance if available from the following offices:

1. Environmental Protection Agency Regional Offices

2. Shellfish Regulatory Agencies: (Appendix A)

3. Food and Drug Administration: (Appendix B)

APPENDIX A
SHELLFISH REGULATORY AGENCIES

STATE OFFICIALS RESPONSIBLE FOR GROWING AREA CLASSIFICATION AND EVALUATION OF THE EFFECT POLLUTION SOURCES HAVE ON SHELLFISH GROWING WATERS

ALABAMA

Director
Environmental Health Administration
Alabama State Department of Public Health
State Office Building
Montgomery, Alabama 36104

Director
Water Improvement Commission
Department of Public Health
State Office Building
Montgomery, Alabama 36104

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Water Sanitation Section
California State Department of Health
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Berkeley, California 94704
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CONNECTICUT

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Environmental Health Services Division
Connecticut Department of Health
State Office Building
79 Elm Street
Hartford, Connecticut 06108
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DELAWARE

Chief
Bureau of Environmental Health
Department of Health & Social Services
Jesse S. Cooper Memorial Building
Dover, Delaware 19901
(302) 678-4731

Director
Division of Environmental Control
Department of Natural Resources
Legislative Avenue & William Penn Street
Dover, Delaware 19901
(302) 678-4761

FLORIDA

Director
Bureau of Sanitary Engineering
Department of Health & Rehabilitative Services
Box 210
Jacksonville, Florida 32201

Executive Director
Department of Pollution Control
2562 Executive Center Circle, East
Tallahassee, Florida 32301

GEORGIA

Director
Georgia Game & Fish Commission
Department of Natural Resources
Trinity Washington Building
270 Washington Street
Atlanta, Georgia 30334

Director
Environmental Protection Division
Water Quality Section
Room 609, Health Building
47 Trinity Avenue, S.W.
Atlanta, Georgia 30334

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Head
Division of Engineering
Bureau of Environmental Engineering
Louisiana Health & Social Rehabilitation
Services Administration

Box 60630
New Orleans, Louisiana 70160
(504) 527-5113

MAINE

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Maine Department of Marine Resources
State House
Augusta, Maine 04330
(207) 289-2291

Director
Fisheries Research Station
Department of Marine Resources
Boothbay Harbor, Maine 04575
(207) 633-5572

MARYLAND

Chief
Division of General Sanitation
Department of Health & Mental Hygiene
610 N. Howard Street
Baltimore, Maryland 21201

Chief
Division of Water and Sewerage
Environmental Health Administration
Department of Health and Mental Hygiene
610 N. Howard Street
Baltimore, Maryland 21201
(301) 383-2763

MASSACHUSETTS

Director
Division of Environmental Health
Massachusetts Department of Public Health
600 Washington Street
Boston, Massachusetts 02111
(617) 727-2691

MISSISSIPPI

Director
Division Sanitary Engineering
Mississippi State Board of Health
Box 1700
Jackson, Mississippi 39205

Executive Director
Water Pollution Control Commission
Box 827
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State Biologist
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Ocean Springs, Mississipi 39564

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Bureau of Consumer Protection - Public Health
New Hampshire Department of Health & Welfare
State Laboratory Building
Hazen Drive
Concord, New Hampshire 03301
(603) 271-2747

Director
Water Supply and Pollution Control Commission
Prescott Park
105 Loudon Road
Concord, New Hampshire 03301
(603) 271-3503

NEW JERSEY

Chief
Program Operation Section
Bureau of Water Pollution Control
Division of Water Resources
Department of Environmental Protection
209 E. State Street
Trenton, New Jersey 08625

NEW YORK

Chief
Bureau of Environmental Control
New York State Department of
Environmental Conservation
Building No. 40
State University of New York
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NORTH CAROLINA

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OREGON

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Director
Water Quality Programs
Oregon Department of Environmental Quality
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Portland, Oregon 97205

RHODE ISLAND

Chief
Division of Water Supply and
Pollution Control
Rhode Island Department of Health
75 Davis Street
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SOUTH CAROLINA

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Division of General Engineering Services
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TEXAS

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Texas State Department of Health
1100 West 49th Street
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VIRGINIA

Director
Bureau of Shellfish Sanitation
Virginia State Department of Health
109 Governor Street
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Virginia State Water Pollution Control Board
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Washington Department of Social
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APPENDIX B
FOOD AND DRUG ADMINISTRATION
REGIONAL OFFICES

REGION I Maine New Hampshire Vermont Massachusetts Rhode Island Connecticut	Chief, Investigations Branch DHEW, PHS, FDA 585 Commercial Street Boston, Mass. 02109 (617) 223-5850
REGION II New York New Jersey Puerto Rico	Director, National Consultant Br. DHEW, PHS, FDA 850 Third Avenue Brooklyn, N.Y. 11232 (212) 788-5000 Ext. 1451
REGION III Pennsylvania Delaware Maryland Virginia W. Virginia	Director, National Consultants Br. DHEW, PHS, FDA 2nd and Chestnut Sts. Room 1204 Philadelphia, Pa. 19106 (215) 597-7727
REGION IV Kentucky Tennessee N. Carolina S. Carolina Georgia Florida Alabama Mississippi	Regional Director DHEW, PHS, FDA 880 W. Peachtree St., N.W. Atlanta, Georgia 30309 (404) 526-3576
REGION V Ohio Indiana Michigan Illinois Wisconsin Minnesota	Director, National Consultants Br. DHEW, PHS, FDA 175 W. Jackson, Rm. A-1945 Insurance Exchange Bldg. Chicago, Illinois 60604 (312) 353-1046

REGION VI Arkansas Louisiana Oklahoma Texas N. Mexico	Director, National Consultants Br. DHEW, PHS, FDA 500 S. Ervey St. Suite 470-B Dallas, Texas 75202 (214) 749-7221
REGION VII Iowa Missouri Nebraska Kansas	Deputy Regional Food and Drug Director DHEW, PHS, FDA 1009 Cherry St. Kansas City, Mo. 64106 (816) 374-3817
REGION VIII N. Dakota S. Dakota Montana Wyoming Colorado Utah	Director Investigations Br. DHEW, PHS, FDA 500 U.S. Custom House Denver, Colorado 80202 (303) 837-4915
REGION IX Arizona California Hawaii Nevada Guam Am. Samoa	Acting Director National Consultants Br. DHEW, PHS, FDA 50 Fulton Street San Francisco, Calif. 94102 (415) 556-2062
REGION X Washington Oregon Idaho Alaska	Director, National Consultants Br. DHEW, PHS, FDA Room 5003 909 1st Avenue Seattle, Wash. 98104 (206) 442-0480